

LISTING OF THE CLAIMS

Claims 1-40 were originally pending. Please amend claims 1-40. No claims are canceled or withdrawn. Accordingly, claims 1-40 remain pending.

The following listing of claims replaces all prior versions and listings of claims in the application.

1. (Currently amended) A computer-implemented method comprising:

identifying relationships ~~among respective ones of two or more~~
between multi-type data objects, wherein the ~~respective ones~~ multi-type
data objects comprise at least one object of a first type and at least one
object of a second type different from the first type; ~~and~~

iteratively clustering the multi-type data objects in view of
respective ones of the relationships to generate reinforced clusters; and

wherein the reinforced clusters are for use by a search term
suggestion component to respond to a search query from a user with terms
relevant to the search query.

2. (Currently amended) A The method ~~as recited in~~ of claim 1,
wherein the relationships comprise inter-layer relationships including one
or more of content related information, user interest in an associated topic,
and user interest in an associated Web page.

3. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein the relationships comprise intra-layer relationships including one or more of query refinement(s), recommended Web page(s), and relationship(s) between respective users.

4. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein each of the multi-type data objects are related to one or more of a search query data object type, a selected Web page type, and a user information type.

5. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein respective ones of the relationships are weighted to indicate importance to associated objects of the multi-type data objects.

6. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein identifying and iteratively clustering are performed for search term suggestion.

7. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein iteratively clustering further comprises propagating clustering results of a first iteration to all related data objects of the multi-type east two of the related data objects being of heterogeneous data type, the propagating being used to enhance clustering of respective ones of the multi-type data objects in a second iteration of reinforced clustering operations.

8. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein iteratively clustering further comprises determining a similarity between individual ones of the multi-type data objects, the similarity being a function of one or more of inter-object and intra-object content similarity and similarities between respective ones of the relationships.

9. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein iteratively clustering further comprises merging related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

10. (Currently amended) A The method ~~as recited in~~ of claim 1, wherein the method further comprises mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types.

11. (Currently amended) A The method as recited in of claim 10, wherein mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types is based on the following:

$$\begin{cases} a(X) = \beta L_X^T h(X) + (1 - \beta) L_{XY} i(Y) \\ h(X) = \beta L_X a(X) + (1 - \beta) L_{XY} i(Y) \\ i(X) = a(X) + h(X) \\ a(Y) = \gamma L_Y^T h(Y) + (1 - \gamma) L_{YX} i(X) \\ h(Y) = \gamma L_Y a(Y) + (1 - \gamma) L_{YX} i(X) \\ i(Y) = a(Y) + h(Y) \end{cases}$$

wherein $X = \{x_1, x_2, \dots, x_m\}$ and $Y = \{y_1, y_2, \dots, y_n\}$ represent respective object sets of heterogeneous object type, with relationships R_X , R_Y , R_{XY} and R_{YX} if directionality is considered ~~represent relationships between respective objects of the multi-type data objects,~~ L_X and L_Y represent adjacent matrixes of ~~link~~ links identifying relationships structures within set X and Y respectively, L_{XY} and L_{YX} represent adjacent matrixes of links identifying ~~relationships~~ from objects in X to objects in Y , $a(X)$ and $h(X)$ are an *authority* score and *hub* score of nodes within X , ~~respectively,~~ respectively, $a(Y)$ and $h(Y)$ respectively represent ~~stand for the~~ *authority* and *hub* scores of nodes in Y , ~~Y,~~ $i(X)$ and $i(Y)$ respectively represent ~~stand for~~ an *the importance* of the nodes in X and Y , respectively and β and γ are the weight parameters to adjust ~~the~~ influence of links derived from different relationships.

12. (Currently amended) A ~~The method as recited in~~ of claim 1,
and further comprising:

responsive to receiving a term from a user, comparing the term with
a feature space of objects in the reinforced clusters;

responsive to comparing, identifying one or more search term
suggestions; and

communicating the search term suggestions to the user.

13. (Currently amended) A computing device comprising:

a processor; and

a memory coupled to the processor, the memory comprising
computer-program instructions executable by the processor for:

identifying relationships ~~among respective ones of two or more~~
between multi-type data objects, wherein the ~~respective ones~~ multi-type
data objects comprise at least one object of a first type and at least one
object of a second type different from the first type;

iteratively clustering the multi-type data objects in view of
respective ones of the relationships to generate reinforced clusters, ~~;~~ and
~~wherein respective ones of each relationship of the relationships are being~~
weighted to indicate an importance to associated objects of the multi-type
data objects; and

wherein the reinforced clusters are for use by a search term
suggestion component to respond to a search query from a user with terms
relevant to the search query.

14. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the relationships comprise inter-layer relationships including one or more of content related information, user interest in an associated topic, and user interest in an associated Web page.

15. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the relationships comprise intra-layer relationships including one or more of query refinement(s), recommended Web page(s), and relationship(s) between respective users.

16. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein identifying and iteratively clustering are performed for search term suggestion.

17. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the computer-program instructions for iteratively clustering further comprise instructions for aggregating ~~indicated~~ data object relationships to related ones of the multi-type data objects based on content of the reinforced clusters.

18. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the instructions for iteratively clustering further comprise instructions for determining a similarity between individual ones of the multi-type data objects, the similarity being a function of one or more of inter-object and intra-object content similarity and similarities between respective ones of the relationships.

19. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the instructions for iteratively clustering further comprise instructions for merging related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

20. (Currently amended) A The computing device ~~as recited in~~ of claim 13, wherein the instructions for iteratively clustering further comprise instructions for iteratively clustering until all object types represented by the multi-type data objects converge.

21. (Currently amended) A The computing device ~~as recited in~~ of claim 13, and further comprising instructions for:

responsive to receiving a term from a user, comparing the term with a feature space of objects in the reinforced clusters;

responsive to comparing, identifying one or more search term suggestions; and

communicating the search term suggestions to the user.

22. (Currently amended) A tangible computer-readable data storage medium comprising computer-executable instructions executable by a processor for:

identifying one or more of intra-layer and inter-layer relationships ~~among respective ones of two or more~~ between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type; and

iteratively clustering the multi-type data objects in view of respective ones of the relationships to generate reinforced clusters; and

wherein the reinforced clusters are for use by a search term suggestion component to respond to a search query from a user with terms relevant to the search query.

23. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein the inter-layer relationships comprise one or more of content related information, user interest in an associated topic, and user interest in an associated Web page.

24. (Currently amended) A The computer-readable medium as ~~recited in~~ of recited in claim 22, wherein the intra-layer relationships comprise at least one of query refinement(s), recommended Web page(s), and relationship(s) between respective users.

25. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein each of the multi-type data objects are related to at least one of a search query data object type, a selected Web page type, and a user information type.

26. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein respective ones of the relationships are weighted to indicate an importance to associated objects of the multi-type data objects.

27. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein identifying and iteratively clustering are performed for search term suggestion.

28. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein iteratively clustering further comprises propagating clustering results of a first iteration to all related data objects of the multi-type data objects, at least two of the related data objects being of heterogeneous data type, the propagating being used to enhance clustering of respective ones of the multi-type data objects in a second iteration of reinforced clustering operations.

29. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein iteratively clustering further comprises determining a similarity between individual ones of the multi-type data objects, the similarity being a function of at least one of object content similarity and similarities between respective ones of the relationships.

30. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein iteratively clustering further comprises merging related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

31. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, wherein the instructions further comprise instructions for mutually reinforcing an importance of individual ones of the multi-type data objects within an object type and between different object types.

32. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 31, wherein mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types is based on the following:

$$\begin{cases} a(X) = \beta L_X^T h(X) + (1 - \beta) L_{XY} i(Y) \\ h(X) = \beta L_X a(X) + (1 - \beta) L_{XY} i(Y) \\ i(X) = a(X) + h(X) \\ a(Y) = \gamma L_Y^T h(Y) + (1 - \gamma) L_{YX} i(X) \\ h(Y) = \gamma L_Y a(Y) + (1 - \gamma) L_{YX} i(X) \\ i(Y) = a(Y) + h(Y) \end{cases}$$

wherein $X = \{x_1, x_2, \dots, x_m\}$ and $Y = \{y_1, y_2, \dots, y_n\}$ represent respective object sets of heterogeneous object type; with relationships R_X , R_Y , R_{XY} and R_{YX} if directionality is considered ~~represent relationships between respective objects of the multi-type data objects, L_X and L_Y represent adjacent matrixes of link~~ links identifying relationships structures within set X and Y respectively, L_{XY} and L_{YX} represent adjacent matrixes of links identifying ~~relationships from objects in X to objects in Y , $a(X)$ and $h(X)$ are an authority score and hub score of nodes within X ,/respectively, respectively, $a(Y)$ and $h(Y)$ respectively represent stand for the authority and hub scores of nodes in Y ;~~ $i(X)$ and $i(Y)$ respectively represent stand for an the importance of the nodes in X and Y , respectively and β and γ are the weight parameters to adjust the influence of links derived from different relationships.

33. (Currently amended) A The computer-readable medium as ~~recited in~~ of claim 22, and further comprising instructions for:

responsive to receiving a term from a user, comparing the term with
a feature space of objects in the reinforced clusters;

responsive to comparing, identifying one or more search term
suggestions; and

communicating the search term suggestions to the user.

34. (Currently amended) A computing device comprising:

identifying means to identify relationships ~~among respective ones of~~
~~two or more~~ between multi-type data objects, wherein the multi-type data
objects comprise at least one object of a first type and at least one object of
a second type different from the first type; ~~and~~

iterative clustering means to iteratively cluster the multi-type data
objects in view of respective ones of the relationships to generate reinforced
clusters; and

wherein the reinforced clusters are for use by a search term
suggestion means to respond to a search query from a user with terms
relevant to the search query.

35. (Currently amended) A The computing device ~~as recited in~~ of
claim 34, wherein the computing device further comprises weighting means
to weight respective ones of the relationships to indicate an importance to
associated objects of the multi-type data objects.

36. (Currently amended) A The computing device as ~~recited in~~ of claim 34, wherein the computing device further comprises determining means to locate a search term suggestion from the reinforced clusters responsive to receipt of a bid term, the search term suggestion substantially matching or being related to one or more of the multi-type data objects.

37. (Currently amended) A The computing device as ~~recited in~~ of claim 34, wherein the iterative clustering means further comprise aggregating means to propagate ~~indicated~~ data object relationships to related ones of the multi-type data objects based on content of the reinforced clusters.

38. (Currently amended) A The computing device as ~~recited in~~ of claim 34, wherein the iterative clustering means further comprise determining means to determine a similarity between individual ones of the multi-type data objects, the similarity being a function of at least one of object content similarity and similarities between respective ones of the relationships.

39. (Currently amended) A The computing device as ~~recited in~~ of claim 34, wherein the iterative clustering means further comprise merging means to combine related ones of the multi-type data objects to reduce feature space dimensionality of the related ones.

40. (Currently amended) A The computing device ~~as recited in~~ of claim 34, and further comprising:

comparing means, responsive to receiving a term from a user, to compare the term with a feature space of objects in the reinforced clusters;
and

responsive to comparing, identifying means to identify one or more search term suggestions.